THE ROLE OF QUALITY ASSURANCE IN DEPARTMENT OF DEFENSE PROCUREMENT

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THE ROLE OF QUALITY ASSURANCE IN DEPARTMENT OF DEFENSE PROCUREMENT

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ABSTRACT

The United States Government is this country's largest purchaser. The Department of Defense (DoD) alone spends billions of dollars each year to procure goods to support complex logistical efforts. Most of the purchased material is subjected to some form of surveillance by contractor and/or government representatives in order to assure that it meets quality and reliability requirements. DoD places great emphasis on "doing it right the first time" because of the real-time battlefield environment of DoD operations.

This paper attempts to explain the role of quality assurance in DoD and its function in the DoD procurement system.

PART I

SCOPE OF DEPARTMENT OF DEFENSE PROCUREMENT

1.1 The Department of Defense Procurement Mission

DOD's procurement mission is to develop and supply the weapons, services, and supplies required to meet the nation's defense objectives. The basic goal---readiness to defend our vital interests---remains fixed. The methods of achieving that goal are constantly changing.

1.2 Establishing the Program

1.2.1 The DOD Program System

The nation's military objectives and defense procurement objectives are closely knit. Only a well-integrated planning, programming, and budgeting process could manage them. The DOD Program System is that process. It organizes defense objectives into programs---broad sets of program elements based on a common mission or set of purposes. Program elements, in turn, represent an integrated activity---a combination of men, equipment, and facilities which together constitute an identifiable military capability or support activity. The Program System provides for analysis of the projected programs for a five-year period to determine the best use of the three M's, men, money, and material, for defense. The programs that are

approved constitute the Five-Year-Force-Structure. The Program System also constitutes the link between military plans, which form the basis for determining material requirements, and the military budget, by which resources are made available.

The Five-Year-Force-Structure is not a static program. Programs within the Five-Year-Force-Structure are constantly reviewed against changes in military concepts and breakthroughs or setbacks in defense technology. Necessary changes may be recommended at any time and a new projection of program objectives for a fifth year is added annually, as the goals for the ending fiscal year drop out of the plan.

The Five-Year-Force-Structure is composed of nine programs: (1)

(i) STRATEGIC RETALIATORY FORCES

(ii) CONTINENTAL AIR AND MISSILE DEFENSE.

(iii) GENERAL PURPOSE FORCES.

(iv) AIRLIFT AND SEALIFT.

(v) RESERVE AND GUARD FORCES.

(vi) RESEARCH AND DEVELOPMENT.

(vii) GENERAL SUPPORT

(viii) CIVIL DEFENSE.

(ix) MILITARY ASSISTANCE.

These programs constitute the nation's plan for defense. They are accompanied by cost data for each program element.

1.2.2 The Procurement Program

The military operational goals of the Five-Year Force-Structure are the basis for defense procurement requirements. However, the procurement requirements for any given year are established by the budget process and they are conditioned by the regulatory and organizational framework in which they are set.

1.3 The Defense Budget Process

The Defense budget is based on programs and objectives developed each year by the National Security Council with the advice of the Intelligence agencies, the Secretaries of Defense and the Military Departments, and the Joint Chiefs of Staff, among many others. Following issuance of general policy guidelines, the organizational elements of each Military Department submit their annual budget estimates for review by their Departmental Comptrollers. Each Secretary approves the overall budget for his Department. The several budgets are then transmitted to the Assistant Secretary of Defense (Comptroller), who holds hearings on them and evaluates them in relation to each other. Thereafter, a single budget for the Department of Defense is approved by the Secretary of Defense and submitted to the Bureau of the Budget.

that agency reviews the estimates and justifications, and balances the proposed budget for the Department of Defense against the competing claims of other Government agencies. After the Bureau of the Budget has completed the process of reconciliation, it incorporates all the executive agency budgets into the President's budget document for presentation to the Congress.

In January of each year, the President's budget is transmitted to Congress. The House of Representatives and the Senate then deliberate over it, holding extensive hearings. When they reach agreement on the program for the fiscal year, they authorize it by statute and then appropriate funds to accomplish it. As a general rule, the Appropriation Acts provide no machinery to control the use of the appropriations. The legislative function is, in effect, complete when the funds have been appropriated; thereafter, it remains for the executive branch to use the appropriation for the purposes, and within the time limit, specified by the Congress in the Appropriation Acts. This does not mean, of course, that the executive branch can spend appropriated monies without any further controls. Numerous other laws, regulations, and financial management policies direct expenditures.

1.4 The Regulatory Framework for Procurement

1.4.1 Title 10 United States Code

The basic law governing defense procurement is

Title 10, Chapter 137, of the United States Code.[2] In 1956 this law incorporated (with certain reservations) the Armed Services Procurement Act of 1947. For the sake of convenience, the present law is still referred to as the "Procurement Act."

The Procurement Act provides for two methods of procurement---formal advertising and negotiation. Formal advertising must be used except when advertising is impracticable and falls within certain categories established by the Act. These categories---or exceptions, as they are referred to---provide the authority to negotiate. The Act also prescribes certain procedures for formal advertising and sets forth specific restrictions and qualifications as to the types of contracts that may be used.

1.4.2 The Armed Services Procurement Regulation (ASPR)

The ASPR is jointly issued by the Military Departments;[3] (i) to provide uniform policies for carrying out the provisions of the Procurement Act and (ii) to establish policies for procurement areas not covered by it. In addition, the ASPR provides direction and guidance for complying with pertinent statutes and Executive Orders. It covers policies, practices, and procedures for both formal advertising and negotiation. It also covers other procurement topics such as pricing, types of contracts, contract clauses, and contract cost principles. Representatives of the Department of Defense, the three Departments, and the Defense Supply Agency form the

ASPR Committee, which meets periodically to discuss revisions and additions to, and deviations from, the Regulation. Representatives of industry are consulted both in drafting the Regulation and in discussing proposed changes. Deviations from ASPR may sometimes be authorized by a Military Department if they affect only one contract or procurement. If a deviation affects more than one contractor, it may still be desired to forward it for consideration by the ASPR Committee or the Assistant Secretary of Defense (Installations and Logistics).

1.4.3 Department Regulations

Department Regulations implement ASPR. The Navy issues the Navy Procurement Directives (NPD), the Air Force issues the Air Force Procurement Instructions (AFPI), and the Army issues the Army Procurement Procedures (APP). The Defense Supply Agency provides the Defense Supply Procurement Regulation (DSPR). These regulations largely parallel ASPR in outline and format, providing additional policy and procedural guidance within the framework of ASPR policies.

1.4.4 Other Directives

Some DOD procurement policies and procedures are not suitable for inclusion in ASPR. Others must be distributed faster than the periodic revision of the ASPR permits. DOD handles both of these cases by issuing special instructions, directives, or circulars. The Military Departments

also issue their own publications (directives, instructions, notices, and so forth) with respect to their procurements. These must, of course, be compatible with the applicable higher level regulations.

1.5 The Organizational Framework

1.5.1 The Military Departments

Within each Military Department, there is an Assistant Secretary in charge of military procurement---the Assistant Secretary of the Army (Installations and Logistics), the Assistant Secretary of the Navy (Installations and Logistics), and the Assistant Secretary of the Air Force (Installations and Logistics). At the next lower echelon, a military official in each Department coordinates and directs the overall procurement operation.

Most military procurement is handled centrally because this is usually the most efficient and economical way to do it. However, certain supplies and services---common, off-the-shelf items with low dollar values, for example---are procured locally by Army, Navy, and Air Force field activities and installations.(4)

1.5.1.1 Department of the Army. The Army Material Command (AMC) is comprised of seven subordinate commands, five of which are commodity-type commands---responsible for research, development, production, and procurement in their assigned

commodity areas. These five commands and their specific areas of responsibility are listed below:[5]

(i) U. S. Army Weapons Command. Procurement of major Army weapons and combat vehicles.

(ii) U. S. Army Munitions Command. Procurement of nuclear and non-nuclear ammunition.

(iii) U. S. Army Mobility Command. Procurement of planes, tanks, automotive equipment, and other transportation-type material---together with general support equipment and supplies.

(iv) U. S. Missile Command. Procurement of free rockets, guided missiles, and associated equipment.

(v) U. S. Army Electronics Command. Procurement of communications systems, electronic warfare systems, combat surveillance systems, automatic data processing equipment, radar, and meteorological material.

The Corps of Engineers, a separate organizational element, is responsible for engineering, construction, maintenance and repair of real estate for the Army---and for the Air Force and other Government agencies, as assigned.

1.5.1.2 Department of the Navy. The conduct of the Navy material mission is the responsibility of the Naval Material Command. The mission of the six material commands is

as follows:

(i) Naval Air Systems Command. Procurement of all Navy and Marine Corps aircraft, and guided missiles---including major components and equipment; services related to their maintenance and repair; and related research and development.

(ii) Naval Ships Systems Command. Procurement of naval vessels of all types, research and development on such items, and materials and appliances connected with chemical and biological warfare defense. It also procures all vessels and watercraft needed by the Army and Air Force and contracts with private shipyards for ship repair.

(iii) Naval Facilities Engineering Command. Procurement of services and materials related to public works (including construction and repairs at shore activities), public utilities, and transportation not otherwise assigned.

(iv) Naval Supply Systems Command. Management of the Navy's field purchasing organization, which procures the replacement spares, parts, and related consumables for major items purchased by the technical systems command.

(v) Naval Ordnance Systems Command. Procurement of all Navy and Marine Corps ordnance and rockets.

(vi) Naval Electronic Systems Command. Procurement of all electronic equipment and repair and supporting parts used by the Navy.

In addition, the Office of Naval Research procures (i) basic research of a general nature, (ii) the design and development of training devices, and (iii) special research projects that support those being conducted by the various material bureaus. The Bureau of Naval Personnel procures services and materials needed to recruit, train, and care for naval personnel. The Bureau of Medicine and Surgery directs research in the fields of general medicine and dentistry, and the Marine Corps procures all equipment, supplies, and services for its operational mission for which procurement responsibility has not been assigned elsewhere.

1.5.1.3 Department of the Air Force. The responsibility for Air Force procurement is shared by three major organizational units under the Chief of Staff. Assignments are divided as follows:(6)

(i) The Air Force Systems Command. The Air Force Systems Command controls aircraft, missile, and space systems from the developmental throughout the operational stages. Applied research,

development, and production contracts are handled within the Command by four major Divisions. These divisions and their areas of responsibility are listed below:

(a) Ballistic Systems Division. Procurement of ballistic missiles, their guidance systems, power plants, nose cones, and specialized ground support equipment and installations.

(b) Space Systems Division. Administration and procurement of space technology and its military applications.

(c) Aeronautical Systems Division. Procurement of manned aircraft weapon systems and aerodynamic nonballistic missile systems.

(d) Electronics Systems Division. Procurement of integrated warning and control systems for air defense, electronic data processing equipment, and related items.

(ii) The Air Force Logistics Command. This command bears the responsibility for the world-wide logistics support systems of the Air Force.

(iii) Office of Aerospace Research. This third office handles virtually all basic research for the Air Force and certain applied research that is not the responsibility of the System Command.(7)

1.5.2 The Department of Defense

The Department of Defense was created as part of a reorganization program to provide integrated policies and procedures for departments, agencies, and functions that are directly concerned with national security. DOD includes the Secretary of Defense, the Deputy Secretary of Defense, the Defense Staff Offices, the Joint Chiefs of Staff and the Joint Staff, the three Military Departments, and other DOD agencies that the Secretary of Defense establishes to meet specific requirements.(8)

The Assistant Secretary of Defense (Installations and Logistics) is the principal staff assistant to the Secretary of Defense in the field of material requirements. He establishes procurement policies and procedures for the entire department. The Director of Defense Research and Engineering is the principal adviser in scientific and technical matters. He supervises all research and engineering activities.(9)

1.5.2.1 Defense Supply Agency (DSA). Because of the important role of DSA and their Defense Contract Administration Services (DCAS) in the field of contract administration and particularly quality assurance, some details on the

organization and operation of DSA and DCAS will be provided.

The Secretary of Defense established the Defense Supply Agency, he established two primary objectives for the Agency.(10)

First, to insure effective and timely support of the military services in the event of mobilization, war or other national emergency, as well as in peacetime.

Second, to furnish this support at the lowest feasible cost.

The order in which these objectives are stated is important. It reflects the priority which governs all DSA programs. This priority and these objectives also govern the criteria against which DSA's achievements are measured.

Thus, DSA is the first agency to be given responsibility for management of commonly used supplies and services for the Armed Forces. As an organization, it reports directly to the Secretary of Defense. Its field commanders, in turn, report directly to the Director of DSA. Through this simplicity of organization, several former layers of administration and supervision have been eliminated and the decision-making process has been speeded up.(11)

DSA is essentially a consolidated wholesaler. Its job is to procure and distribute those food, medical, clothing and textile, petroleum, industrial, general, construction, chemical, automotive and electronic items which can most effectively be handled through a program of integrated management by the Department of Defense.

Other DSA assignments include management of Defense industrial plant equipment, traffic management, administration of the Federal Supply Catalog and surplus property disposal.(12)

The headquarters staff, under the Director in the direction and control of the Agency and is concerned with broad planning and management of the total DSA mission and the establishment of long- and short-range objectives and standards of performance. It has personnel assembly the joint military staffing principle, with each of the military departments represented at the Directorate or immediately subordinate level.

1.5.2.2 Defense Contract Administration Service.

During 1962 and part of 1963 a study known as Project 60 was conducted under the policy guidance of high level Department of Defense military and civilian personnel.(13) The study indicated the existance of considerable overlap and duplication in contract administration services functions, and further, it indicated the feasibility of consolidating the functions for management on a centralized basis. A pilot test demonstrated the feasibility and potential advantages of consolidating contract administration services functions on a nation-wide basis.

A national planning group, composed of temporary duty personnel from the military services and DSA, developed a plan which was approved by the Secretary on December 28, 1964.

The plan provided for gradual phaseout [illegible] of the DCAS headquarters element and for a three-phased schedule for consolidating and merging the contract administration services components of the military services and DSA into 11 Defense contract administration services regions (DCASR's), responsible for administering contracts under the centralized management concept. Consolidation of contract administration services functions within DSA involved the merging of 165 military service and DSA contract management offices, and approximately 20,000 people identified by the military services and DSA as performing contract administration services functions. The consolidation resulted in a reduction in the number of contract management offices from 165 to approximately 100, and in a saving of approximately 10 percent in the number of personnel formerly engaged in contract administration functions.(18)

DCAS is responsible for providing a wide variety of support services to the purchasing offices of the military services, and NASA, including preaward surveys, review of contractor purchasing systems, industrial security, quality assurance and inspection, property administration, production surveillance and reporting, transportation, payments to contractors, and other functions required in connection with industry performance on defense contracts. DCAS performs those procurement support functions that can best be handled at or in close proximity to the contractor's plant.

In addition to retaining responsibility for contract awards, the military services are responsible for the administration of those categories of contracts not included in the mission assignment to DSA; for example, contracts involving perishable subsistence items, basic research studies, military and civilian construction, repair and overhaul of naval vessels, small purchases, and purchases in certain plant cognizance assigned facilities.

At the end of fiscal year 1968, DSA was administering some 252,000 prime and secondary contracts valued at over $50 billion. During the year DSA inspected and released for shipment over $20½ billion worth of material. DSA paid some two million contractor invoices during FY 1968.(15)

1.6 Purchase Procedures

1.6.1 Basic Principles

It is not the intent of this paper to delve into the details of the DOD procurement function. However, the workings of those purchase and contract administration functions associated with Quality Assurance function will be explained in some detail.

A basic principle in DOD procurement is to give all known responsible suppliers an equal chance to compete for Government contracts.(16) In order to do this, the Government publicizes its intentions to buy through advertisements and announcements in various media and by sending invitations for bids to business firms whose names are on

applicable mailing lists. Bids are opened on the deadline date, and the lowest responsible bidder meeting the specifications is awarded the contract.

In certain circumstances it is not practical, not economical, or not possible to obtain bids. In such instances, regulations permit the Government to negotiate for the items it intends to procure. Procurement by negotiation, or unadvertised procurement, is specifically limited to those situations listed in ASPR.

Procurement by negotiation does not relieve the Government procurement officer of his responsibility to secure competition whenever possible. Normally the procurement office will contact several reliable suppliers and award the contract to the one whose price and delivery of a product conforming to specifications will result in the most value received by the Government. ASPR requires that different types of contracts, (fixed price, cost plus incentive fee, fixed price redeterminable, etc.) be used according to the circumstances at hand to assure the optimum utilization of government funds.

Another basic principle in procurement is that all supplies, equipment, and commodities offered by a supplier must be inspected and accepted by the Government before payment of the invoice. Inspection and testing are necessary to determine whether the goods offered meet each technical requirement of the contract, particularly the

governing specifications.(17)

1.6.2 Description of Supplies and/or Services

The description of the required supplies or services is a critically important element of the procurement request. From the statement of what is required, the other elements of the procurement proceed; the method of procurement is determined, the source list is compiled, the contract terms and conditions are selected, the work is performed, and the results are evaluated. The applicable specifications and related documents accompany the procurement request to the contracting activity.(18)

1.6.2.1 Specifications, Standards and Drawings. Specifications are descriptions of the technical and other requirements established for the supplies being procured. Items for which there is a repetitive demand are described by standard specifications---known as Federal and Military specifications. Seldom-used items are sometimes defined by a more informal purchase description; this, too, sets forth the essential characteristics and functions of the supplies or services.

Specifications cover the material requirements for an item, standards and other documents prepared for the procurement establish engineering and technical limitations and applications. New standards prepared by the Military Departments are issued as Federal or Military standards, as appropriate.

It is not always possible to define attributes of an item with a written description. For this reason, drawings may be incorporated by reference in a number of Federal and Military specifications; they may also be used as part of purchase descriptions.

1.6.2.2 Federal Specifications. Federal specifications cover materials, products, or services used---or expected to be used---by at least two Federal agencies (at least one of which is civilian). The General Services Administration supervises their preparation and issuance. With a few exceptions, Federal specifications are concerned with commercial type items.

1.6.2.3 Military Specifications. Military specifications cover materials, products, or services used solely or predominantly by the Military Departments (as opposed to civilian agencies). Coordinated Military specifications cover items of interest to two or more Departments and are coordinated with all Departments. Limited coordinated Military specifications are prepared and issued by a single Department. They satisfy an immediate procurement need of that Department or govern items that are of interest to it alone. If they are coordinated with all Military Departments, they become full Military specifications. A Military specification, when published, supercedes others published for the same item by the Military Departments.

ASPR provides that Federal and coordinated Military

specifications that apply to the supplies or services to be bought must be used by DOD. Certain exceptions apply. DOD may determine that a Federal specification is inapplicable for its use and either Military or Federal specifications need not be used for the following unless required by departmental instructions:(10)

(i) Purchases incident to research and development.

(ii) Purchases of items for test or evaluation.

(iii) Purchases of laboratory test equipment for use by Government laboratories.

(iv) Purchases of items for authorized resale except Military clothing.

(v) Purchases of items in an amount not to exceed $2,500.

(vi) Purchase of one-time procurement items.

(vii) Purchases of items for which it is impracticable or uneconomical to prepare a specification.

1.6.2.4 Adequacy of the Specifications and Drawings. As a basic rule, specifications set forth only the minimum requirements of the Government. Procurements can then be made at the lowest price obtainable, consistent with the actual needs and the funds available. To put it another way, the specifications should describe what is required, not what is desired.

In addition to describing the required supplies or services, the solicitation must also describe the methods that will be used to control their quality. The control methods will vary with the nature of the end item: some will outline what the contractor must do; others will describe the Government's tests. But most of the time they will be determined by whether the item is simple or complex, and the stage of its development. The term "quality assurance" includes all the methods used to control quality.

1.6.2.5 Qualified Products List. Simple off-the-shelf items---such as shoes, clothing and standard capacitors---usually require relatively simple quality program provisions. In some cases, the standard ASPR inspection clauses may be sufficient. In others the end-item specification or the procurement request may state that a Qualified Products List (QPL) is desired.

Qualification is defined as the testing of products for compliance with the requirements of a specification, in advance of and independent of, any procurement action. The qualification procedure is used when the nature of time-consuming tests would unduly delay delivery of the product under contract. In such cases, the specification provides for advance testing of products furnished by the manufacturer and reflecting the products which successfully pass these tests, on lists known as "Qualified Products Lists." These lists are then used in connection with procurement by the

Government or for the Government by its contractors.[20]

The specifications, drawings and other technical requirements become part of the purchase contract. This contract specifies the action necessary by the contractor and the government quality assurance representatives (QAR) to comply with the quality assurance requirements. The function of quality assurance will be covered in the next section.

PART II

QUALITY ASSURANCE IN DOD

2.1 Requirement for quality standards

Mr. John J. Riordan, Director for Quality and Reliability Assurance in the Office of the Assistant Secretary of Defense (Installation and Logistics) had the following to say about quality and reliability:(21)

> In both the private and public sectors of the American economy, there is a strong and growing interest in theory, policies and procedures for assuring that products and services conform to the quality and reliability requirements of consumers. This interest has been catalyzed by increasing recognition of the social and economic costs to the public and to the Government of inferior quality. Understandably, product quality is of vital concern to the Department of Defense (DOD)---a buyer and consumer of vast quantities of supplies and equipment.

As the weapons systems purchased by DOD became more complex, the requirements for quality assurance became more stringent. In 1954 the DOD recognized that the contractors themselves must be made more responsible for a high level of quality assurance. Therefore in 1954 the DOD stated that contractors are responsible for submitting to the government for acceptance only those supplies that conform to contractual requirements.(22) The DOD in turn determines whether supplies and equipment conform to contractual requirements on the basis

of objective evidence, using contractors' quality data, after assuring itself that those data are reliable.

In 1957 DOD implemented instructions pertaining to non-complex items of firm design which are covered by military and federal specifications.(23) The essence of this instruction is as follows:

(i) The contractor is responsible for the performance of examinations and tests as set forth in the product specifications.

(ii) The Government is responsible for verifying that the contractor's inspection operations, methods, and facilities are satisfactory.

In 1959 DOD issued policy guidance to DOD quality and reliability assurance organizations in evaluating and verifying the quality and reliability of complex equipment such as missiles, tanks, and ships.(24) The essentials of this instruction are as follows:(25)

(i) The contractor is responsible for maintaining basic regulation of quality throughout manufacturing operation. Collectively, the elements of this regulation constitutes a "quality program."

(ii) The Government verifies by appropriate means that the supplier's quality program is effective.

Present DOD philosophy on quality assurance places responsibility on;(26)

(i) The Government for establishing contractual quality requirements.

(ii) The contractor for controlling product quality and for offering to the Government, for acceptance, only those supplies and services that conform to contractual requirements and, when required, for maintaining and furnishing substantiating evidence of this conformance.

(iii) The Government for determining that contractual requirements have been complied with prior to acceptance of the supplies or services.

2.2 Determination of Inspection and Quality Assurance Requirements

2.2.1 Basic Principles

The present DOD quality assurance program is managed in accordance with the following basic principles;(27)

(i) Management for quality and reliability assurance

encompasses all supplies and equipment procured, maintained and stored by the Department of Defense.

(ii) This function is aimed not only at preventing defective material from entering the supply system, but equally important, it is designed to improve productivity and promote economy in production.

(iii) The objectives of the quality and reliability assurance program are achieved in coordination with, rather than in duplication, of similar activities in industry.

(iv) The Department of Defense retains exclusively both the right and the responsibility to make final decisions regarding the acceptability of products offered by suppliers to the Department.

(v) The ultimate measure of the effectiveness of a quality program is the performance and reliability of products in service.

2.2.2 Categories of Contract Quality Requirements

The contractual requirements on any DOD procurement concerning quality assurance are applied by the contracting officer as specified by the design agency or as required by ASPR. ASPR Section VII contains inspection

clauses that must be included for various types of procurement. There are five basic categories of contract quality requirements which can be imposed.

2.2.2.1 No Specific Requirements. There may be no specific quality requirements in the contract. Procurements in this catagory have no specific obligation for the contractor to perform inspection and no government procurement quality assurance is required to be performed at the source. The government relies on the contractor's internal controls to obtain the services or supplies specified. This type of quality provision is normally reserved for simple, non-critical, off-the-shelf, commercial items considered small purchases, a total value of less than $2,500. This type of procurement is considered to be the most economical and efficient manner to procure the supplies.

2.2.2.2 Contractor Responsibility Provision. The second catagory of contract quality requirements is referred to as the Contractor Responsibility Provision. The responsibility here is on the contractor for inspection and tests of products before offering them to the government for acceptance. The requirement normally is imposed by one of three methods:

(i) Citing a Federal-Military Specification in the contract which contains a responsibility for inspection clause in Section 4 (the quality assurance provisions of the specification);

(ii) Citing a Federal-Military Drawing in the contract which would carry a note relative to the contractor's responsibility for inspection and test; and

(iii) Including a clause in the contract requiring the contractor to perform or have performed those inspections and tests necessary to substantiate that the supplies conform to specification, contract and technical requirements.

2.2.2.3 Standard Inspection Requirement. The third catagory of quality provisions is the Standard Inspection Requirement, which is mandatory in all fixed price contracts over $2,500. It requires the contractor to maintain an inspection system acceptable to the government. It is included in the standard inspection (boiler-plate) clauses of ASPR.[28] A formally documented inspection system usually is not necessary. A contractor is required to perform inspections and tests necessary to substantiate the products total conformance to all contractual technical and quality requirements. He also is required to maintain complete records of all inspection work performed and make them available to the government during contract performance and for such longer periods as specified in the contract.

2.2.2.4 Specific System. The fourth quality provision catagory of requirements if for a specific inspection system. This is a requirement, in addition to the standard

inspection requirement, that the contractor establish and maintain an inspection system in accordance with Mil-I-45208. This inspection system requirement is normally limited to contracts in which technical requirements are such as to require control of quality by in-process inspections as well as final end item inspection. It includes control of such elements as nonconforming material, measuring and testing equipment, drawings and changes, inspection, documentation and records.

2.2.2.5 Quality Program Requirement. The fifth catagory of quality requirements is the most stringent. This requires, in addition to the standard inspection requirement, that the contractor establish and maintain a quality program in accordance with Mil-Q-9858. This quality program is normally referenced in contracts when the technical requirements of the contract are such as to require control of work operations, in process controls and inspection, as well as attention to organization, planning, work instructions, documentation control and advanced metrology.

2.3 The Procurement Quality Assurance Program (PQAP)

2.3.1 Elements of PQAP

Once the quality requirements are specified and a contract established, the Defense Contract Administration Service assumes its responsibility for contract administration, including quality assurance. The DCAS Procurement

Quality Assurance Program (PQAP) contains five elements;[29]

(i) Procedures Review.

(ii) Procedures Evaluation.

(iii) Product Verification Inspection.

(iv) Contractor Decision Verification.

(v) Corrective Action.

Let us cover the workings of each element in some detail.

2.3.1.1 Procedures Review. Written procedures are generated by the contractor to document quality or inspection method. A review is made of these procedures for conformance and to assure that they adequately specify manufacturing techniques, controls, and inspections.[30] The review is conducted prior to start of production. In addition, during the review, a checklist is developed to use during production for continuing evaluation of procedures in operation.

The quality assurance representative, (QAR) begins the review by searching the contract and related documents to list the requirements. Requirements include the quality system, inspection, acceptance location point, drawings, first article, special tests, technical data package, technical manuals, non-standard parts, specifications standards, preservation, packaging, packing and marking.[31]

Recognition in the 1950's of gross deficiencies in specifying these requirements under government contracts

led to several studies.[32][33] As a result of these studies ASPR and many MIL-SPECS were rewritten with more stringent requirements on adequacy of technical documentation.

The contract summary record is kept on file for quick and ready reference at any time during the life of the contract. This summary record not only serves as a convenient checklist but is used as a reporting form to the contracting officer, pointing out deficiencies in the contract documents furnished. DCAS quality assurance assists the contracting officer in cleaning up discrepancies that have crept into documentation. An early planning step is to review and search the basic hardware specification or purchase description to determine the complexity of the contract.

Depending upon the complicity of the contract, a pre-inspection meeting (for simpler contracts) or a post award conference is recommended by the QAR and called by the administrative contract officer. These meetings, or conferences, get together all interested counterparts of government and industry to discuss all phases of the contract. DCAS quality and engineering people determine the adequacy of the contractor's quality program such as written instructions for production, inspection requirements, test procedures and product-oriented instructions that may be needed.

Various DOD Handbooks on quality assurance are used in the procedures review. Handbook 50[34] (Evaluation of Contractors' Quality Program) contains the reviewing criteria. When a contract requires the inspection system to meet Mil-I-45208A, Handbook 51[35] (Evaluation of Contractors' Inspecting System) is used. Handbook 52[36] (Evaluation of Contractors' Calibration System) is used to determine the adequacy of the company's calibration procedures. Handbook 53[37] (Guide for Sampling Inspection) provides information on sampling inspection principles.

2.3.1.2 Procedures Evaluation. Satisfactory procedures review leads to procedures evaluation as contractor production progresses.[38] Procedures evaluation, assures that the contractor follows his approved written procedures. Acceptability of compliance is checked as early as possible throughout the entire manufacturing cycle to verify the completeness and adequacy of the contractor's procedures in operation. This assures contractor adherence to the procedures which should result in delivery of quality products, manufactured to contract requirements. Checklists, developed during procedures review, are used in subsequent evaluations to ensure maintenance of satisfactory quality and process controls; thus, assurance is provided that the contractor's manufacturing processes and inspections remain in accordance with written procedures, thereby maintaining

quality control.

The QAR looks at the contractor's methods on a plant-wide basis.(39) He determines contractual requirements for the control of quality based on his review of the contractor's procedures. Once these elements are established, an initial evaluation is made comparing the actual operating procedures with the written procedures which were approved in the procedure review.

Procedure evaluation may be initial or continuous. Initial procedure evaluation is the first effort to determine adequacy and conformance. Continuous evaluation is conducted on a scheduled basis to determine degree of conformance by the contractor's personnel to prescribed procedures. Based on the results and degree of compliance, the QAR determines the necessary frequency of the continuing procedure evaluation. He can reduce or lengthen the intervals according to the results. Percent defective observations are kept for each checklist. Low percentage indicates the contractor has control and lengthening the time interval is in order. On the other hand, reduction of the time interval is indicated by a high percent defective observation.

2.3.1.3 Product Verification Inspection. Direct inspection of product characteristics, in-process and end item, is performed for product acceptance, verification of product quality, and adequacy of the contractor's quality controls.(40) Inspection is performed to the degree necessary

to assure contractor compliance to related contractual requirements.

The amount and type of inspection is specified in the contract specifications. In many cases the contracting officer and the QAR have some latitude in the determining of the inspection program. The technical office or cognizant agency can specify mandatory inspection, known as product inspection type A (PIT A). Product inspection type B (PIT B) is established by the QAR for acceptance purposes and to develop documented objective contractor quality history. It is not the policy of DCAS to inspect every item unless required by the contracting officer. If the QAR finds a number of rejections which exceed the acceptance number of the inspection plan, he rejects the entire lot. The plant is then required to screen the lot, investigate failures and come up with preventive action. Product inspection type C (PIT C) is established for reinspection purposes or to insure acceptance of good product when deficiencies are detected through the use of element evaluation. PIT C is maintained until the contractor has regained control of his processes. The higher level of inspection means verification of future lots will be tighter until the acceptance criteria are consistently met, at which time the QAR can reduce the inspection level. Sometimes the QAR does not perform the inspection functions,

but witnesses the plant's technicians inspect or test a product, especially if the product and tests are complex and may take excessive time to complete, or if the tests may be detrimental to the product to repeat.

The results of the company's inspection are compared with the results of the government inspection and/or observations and a rating is assigned in accordance with Handbook 51.(41) The QAR may base his quality actions of acceptance, rejections or corrective action requests on the rating. The company quality control management may be requested to correct their products and/or system.

If the results establish a favorable quality history in the plant, the intensity of DCAS inspection effort is reduced.(42) The quality history in a plant is a collection of data from the company, QAR data and feedback from user agencies.

In a plant with a quality program in operation satisfying the requirements of Mil-Q-9858A, data evaluation is a continuing function used as a basis of acceptance or rejection of product or services, disapproval of written procedures and/or sections of the quality program manual, determining the effectiveness of plant inspection, determining the method of corrective action. At times, the QAR's data evaluation may lead to upgrading of manufacturing methods, revealing current problems and improving quality characteristics of the products.

2.3.1.4 Contractor Decision Verification. Contractor decision verification (CDV) is the direct inspection of product characteristics, not covered during product inspection and test but subsequent to contractor inspection using contractor's inspection records, to determine and verify the accuracy of contractor quality and inspection decisions.(43) Using the checklist, prepared earlier, designated product characteristics are inspected and results are compared to the contractor's inspection records on the same characteristics. Comparability is an indication that the contractor's inspection is effective. If the contractor's compliance grows deficient, verification is proportionately increased. When the contractor's process average exceeds the maximum allowable percent defective, the system is unacceptable for the particular area in which defectiveness occurred.(44)

CDV is similar to routine government inspection however it is randomly applied, unannounced, and involves inspection of characteristics not covered in other inspections.

CDV is based on the principle that company personnel have made inspection decisions; therefore, the QAR can inspect a random sample drawn at diverse scheduling and locations, and confirm or disagree with the company's inspection decisions. He also determines whether procedures are adequate and are followed by the inspectors. The results of CDV and

procedures evaluations are permanently recorded. Any government agencies interested in a company's quality profile may request copies from the cognizant DCAS office. The government records will reflect;

(i) The nature of Government procurement quality assurance actions, including, when appropriate, the number of observations made and the number and type of deficiencies.

(ii) Decisions regarding the acceptability of the products, the processes, and the requirements, together with actions taken to correct the deficiencies.

(iii) Distribution of Government procurement quality assurance effort within the particular contractor's facility.

(iv) The extent to which Government records corroborate contractor records.

2.3.1.5 Corrective Action. Last but not least is corrective action. It is an essential element of any program. It is required of the contractor when any breakdown in his quality program occurs to assure that product quality is not compromised. In addition, it ensures that the correction precludes recurrence.

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corrective action to prevent recurrence of similar defects or failures. Usually the quality engineers analyze discrepancies to find the cause and then determine what action is necessary to prevent recurrence.(45)

Where corrective action on the part of the contractor is required, it will be requested by one or more of the following methods;(46)

(i) Method A. On-the-spot corrective action will be taken with the responsible contractor's personnel to eliminate the cause. The deficiency will be recorded and become a part of Government records. This method alone is not sufficient corrective action on deficiencies revealed through inspections imposed by purchasing offices.

(ii) Method B. A quality deficiency record will be initiated to notify the contractor in writing of the deficiencies found and the requirement for corrective action as to cause. This method is the minimum level of corrective action when deficiencies are revealed through inspections imposed by purchasing offices.

(iii) Method C. A letter will be forwarded by the QAR to the contractor's management

requesting immediate correction of causes of observed deficiencies.

(iv) Method D. The QAR will recommend to the ACO that action be taken to notify the contractor that a serious quality problem exists at the facility and that immediate corrective action must be taken to comply with the provisions of the contract. When considered advisable by the QAR, the ACO will be requested to include in the notification a statement to the effect that acceptance of end-items is being withheld pending receipt and acceptance of the proposed corrective action. A request for assistance from the ACO will, as a minimum contain the following: contractor's name and address, contract number, statement of the problem, history and recommendations. Additional information, such as delivery schedule, should be supplied when appropriate. A copy of each recommendation to the ACO for Method D corrective action will be forwarded to the Contract Administrative Office, Chief of Quality Assurance.

(v) Method E. Where a subcontract is involved, and the requirement for corrective action is

of the magnitude of Method C or D, the QAR at the prime contractor's facility will be informed of the circumstances and requested to have the prime contractor take immediate action with subcontractor.

It is important, that the plant rework or repair the failed part, assembly or end item to bring it within tolerance, if at all possible. But it is even more important to have a complete analysis of the problem, to find the cause of failure and then to come up with the remedy. This remedy or preventive measure insures against repetition in future production.

2.4 Miscellaneous QAR Functions

2.4.1 Authorizing Shipment of Supplies

Depending on contractual requirements either the government inspector or the contractor is responsible for authorizing release of finished products from the supplier's plant. Government authorization is the usual method of release and requires the QAR to sign or stamp the papers accompanying each shipment.

If approved by the Contracting Officer, the contractor can be allowed to assume responsibility for release for shipment of supplies. The following criteria must be met

before contractor release can be authorized;[47]

(i) The signing or stamping of papers by the QAR impair the operation of a planned Procurement Quality Assurance Program, or places an unreasonable demand on the QAR's time.

(ii) There is sufficient continuity of production to permit a systematic and continuing Government evaluation of the contractor's control of quality.

(iii) The contractor has a record of satisfactory product quality, including quality pertaining to preparation of shipment.

2.4.2 Nonconforming Supplies

Nonconforming supplies and services will be identified by the QAR as Type 1 (affecting major areas) or Type 11 (minor and not affecting any of the major areas). Authority for acceptance of Type 1 nonconformance is vested in the Procuring Contracting Officer (PCO) based upon information furnished by the contractor and comments provided by the QAR and the Contract Administration Officer.

Authority for acceptance of Type 11 nonconforming supplies and services is automatically vested in the CAO except when authority for acceptance is specifically withheld in writing by the PCO.[48]

PART III

QUALITY ASSURANCE PROBLEMS, AND ACTION TAKEN TO RESOLVE PROBLEMS

3.1 Technological Development and Need for Upgrading Quality Assurance Personnel

Many industries today control manufacturing processes through the use of computers, lasers and numerically controlled production machines. There are a host of new manufacturing technologies. Quality is controlled by sophisticated procedures, and quality engineers are in charge of such operations.

Quality assurance inspectors trained only in the flashlight and micrometer school just can't do the job. It is an environment demanding QAR's of the highest caliber with good foundations in the technologies with which they are involved.

A current problem facing DCAS is that much of the original civilian input for the department came from the military services. This work force, recruited largely during World War II, now has an average age of 48 years. Also, it is not skilled to the degree necessary to meet the demands of industry during the coming years. Only about 6 percent of the DCAS force has college degrees. Although another 22 percent has some college background, there is a need for more college graduates and more youth.(49)

Career planning in government is more advanced than it is in industry. The OSD has established a system through which an employee and his supervisor can formally chart the next five years of advancement including all necessary training requirements. This is a significant step in the government's plan to attract more qualified individuals from colleges and industry.

At the same time DCAS is lending emphasis to their college recruitment program, they are carefully training their existing employees to satisfy skill requirements. All new employees go through PQAP (Procurement Quality Assurance Program) training. Courses in statistical quality control are a must for advancement.

Many employees take specialized courses depending upon their need to have more advanced or specialized knowledge.(50)

Incentive in terms of salaries has been improved also. Recent increases in civilian pay scales largely overcame the financial advantage of working in industry as opposed to government.

3.2 Upgrading Image of Quality Assurance Representatives

DCAS has asked professional quality control societies, such as the American Society of Quality Control, to assist DCAS in upgrading the image of quality personnel from gage pushers to high level technicians. The QAR is a professional technical decision maker, not just an inspector, and

recognition of this fact by industry will make the QAR's role and performance much better.(51)

3.3 Increased Inspection Flexibility

Another objective of the DCAS-QAR program is increased flexibility of DCAS operation to achieve a more efficient use of quality assurance resources through relief from the detailed inspection requirements of the services. Their principal objection is the requirement to perform specified amounts of product inspection. When DCAS monitors a quality system within a plant, their approach embraces the five elements of PQAP: review the contractor's procedures, evaluate his application of these procedures, verify the adequacy of his decisions, inspect his product and initiate corrective actions as necessary. The concept is that if the system is followed, it will assure that the contractor is producing products in accordance with the specifications.(52)

This system does not envision 100 percent inspection. Although letters of instruction from the services usually do not demand 100 percent inspection, they often impose on DCAS inflexible inspection requirements. These requirements currently consume about 27 percent of the total productive man hours.

Attempts are being made to reduce restrictions and make the services recognize the validity of DCAS's systems approach. The level of DCAS inspection must be verified,

based on the demonstrated effectiveness of each contractor's system. Ideally, manpower effort in a contractor's plant should be completely flexible, enabling DCAS to reduce their efforts as a contractor improves, and to shift such efforts to plants just starting up or to those that are in trouble.

3.4 Reduction in Government Quality Assurance Efforts

The necessity for government quality assurance representatives at plant locations has recently been questioned in view of industry's increasing quality control and reliability efforts. DCAS is still required to verify contractor compliance with contract specifications. Several influential people in the DOD quality assurance field look toward the day of reduced government inspection.(53) They say that a good quality program, adequate quality controls and effective use of quality information is nothing more than good management practice. It should prove profitable to the contractor and should enable him to supply readily the objective quality evidence that the government demands.

Another approach to reduction of DCAS effort is certification of contractors or at least specific product lines of some contractors for their products.(54)

Another technique that fosters disengagement is already being used by the General Services Administration (GSA). They maintain a list of contractors who have high-level quality programs. Contracts with these contractors,

who are subject to minimum quality surveillance by GSA, provide for replacement without cost to the government of any defective products found within six months of delivery.(55)

3.5 Value Engineering

Another program designed to improve the quality of products purchased by DOD is Value Engineering (VE). VE is an organized effort directed at analyzing the function of systems, equipment, and supplies for the purpose of achieving the required performance, quality, reliability, maintainability or interchangeability at the lowest overall cost consistent with performance requirements.(56) In the DOD the term "Military Worth" is used to express the additional combat capability resulting from the VE changes. These are improvements that provide more reliability, easier maintainability, and better performance.(57)

Value Engineering as initiated by DOD in 1962(58) as a contractual requirement advised procurement managers that VE was directed at analyzing the function of defense hardware, stating explicitly that VE is not applied during initial design efforts. However, it was soon recognized that application of VE throughout the R & D phases as well as production design phases was very worthwhile. In fact, the Director of VE, and Assistant Secretary of Defense (Installations and Logistics), Barry J. Shillito, said recently,

"We might roughly say that VE is to the design process what IE (Industrial Engineering) is to the manufacturing process."(59)

DOD encourages the use of VE in their contracts through an elaborate system of sharing clauses, including follow-on contracts for as long as 3 years after completion of contract.(60)

The VE contract clause encourages contractors to develop and submit Value Engineering change proposals (VECP's) provided no increase in contract execution cost is expected. As motivation, contractors share in the savings which in FY 1969 averaged 43 cents in income for contractors for each dollar saved by DOD.(61)

A recent study by DOD of some 193 VE proposals found that reliability was improved 63% of the time, performance 33%, quality 71% of the time, and reduced weight 37%.(62) Other characteristics generally improved were productibility, human factors, parts availability, lead time, logistics, and packaging. In addition to the improvements noted above, the DOD noted that in FY 1969 savings of $342.2 million were credited to VE. Since the VE program was initiated, savings of $1.1 billion are claimed by DOD.(63)

3.6 DOD Zero Defects Program

Few programs have aroused such spontaneous and enthusiastic support as the Zero Defects Program. The aim of Zero Defects is to motivate people at all levels of organization to pay more attention to detail and to workmanship,

thus preventing defects and failures that collectively or individually can be costly and possibly catastrophic. Numerous contractors have now adopted this program. The Army, Navy, Air Force, and the Defense Supply Agency have instituted "in-house" programs. Over six million persons in both industry and the Department of Defense have now heard the Zero Defects message and are cooperating in achieving its objectives.(64)

DOD has provided the basic policies and procedures concerning the DOD Zero Defects program.(65) In addition, a DOD Handbook has been published to furnish guidance for planning, implementing, and sustaining a Zero Defects program.(66)

The program is based on the belief that mistakes are caused by two factors---lack of knowledge and lack of attention.(67) The knowledge factor can be corrected through training. Lack of attention is an attitude problem. A man who commits himself to look at each detail and carefully avoids errors takes a giant step towards setting a goal for perfection in all things. Quality is everyone's business and this program was designed to create, in the mind of every employee, a sense of obligation to get the job done right---the first time.(68)

This is accomplished through a promotional campaign aimed simultaneously upward through management and downward

through the worker levels. All levels are asked to sign pledge cards and are presented gold and silver "Zero Defect" lapel pins. Promotional posters are changed frequently and charts showing each manufacturing group's defect rate, as balanced against company and military requirements are maintained in all work areas. Frequent promotional meetings are held by all supervisors to retain the concept in the minds of everyone. Special awards are made to individuals and to groups. The program has been given added impetus through the local press and even made a part of the U. S. Congressional Record.(69)

3.7 Formation of Advisory Groups Concerning Procurement/Quality Assurance Problems

Several advisory groups of civilian and/or government personnel have been active recently in attempting to eliminate government contracting problems. Three of the most prominent organizations will be briefly explained.

3.7.1 Defense Industry Advisory Council (DIAC)

Recognizing the need for a high level group of defense industry personnel to evaluate problems of effective utilization of our nation's resources, earnings and pricing and DOD contract performance and administration including quality control, the DIAC was established in June, 1962. The Council provides a regular forum for the presentation and consideration of industry views and problems at the highest levels in DOD. The meetings are chaired by the

Deputy Secretary of Defense and the group has 3 scheduled meetings per year.(70)

3.7.2 National Contract Management Association (NCMA)

The NCMA was created to tie up the loose ends of a job called the "Grab Bag Profession." At first, membership was lopsided with many more members from industry than government. Contract officers in federal agencies were reluctant to fraternize too freely with men on the selling side. Conflict of interest was the hedge. Although NCMA published a code of ethics rigidly forbidding any effort to use social contracts to further business ends, it wasn't until 1966 when the DOD officially ruled out conflict of interest that Federal employees began joining in numbers.(71)

Many top level DOD personnel now belong to NCMA including Barry J. Shillito, Assistant Secretary of Defense (Installations and Logistics). The major portion of NCMA's effort is directed toward professional education of industry and government contract management personnel.

3.7.3 National Security Industrial Association (NSIA)

The NSIA is one of the largest associations representing American firms engaged in defense contracting.

NSIA has just announced a plan for a completely independent industry-wide study of the entire defense acquisition process, Robert B. Chapman, chairman of the board of trustees said. The objective will be to survey and review

the whole procurement process, identify problem areas and formulate industry views and recommendations concerning solutions or improvements. According to Vice Admiral Joseph M. Lyle, USN (Ret), president of NSIA, the survey will cover the entire span of Defense procurement policy and practice, including, but not limited to, the following:(72)

(i) Establishment of more realistic requirements, such as performance, quality, reliability, delivery schedules, costs and engineering data.

(ii) Major weapons systems acquisitions.

(iii) Contracting policy, including the selection and application of various types of contract and competition.

(iv) Managerial responsibilities in regard to the proper roles for industry and government, and reporting requirements.

(v) Maintenance of a healthy defense industrial base to include renegotiation; profits vs. risk; proprietary rights; incentives to industry; cost recovery, including "independent research and development" and "bid and proposal"; and subcontracting problems.

If the report points out the weaknesses on both sides of the partnership with complete candor and makes solid and sensible recommendations for the future, the nation will truly benefit.

PART 4

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